Electronic Version
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Claims

[c1] 1. A system for protection against short-circuits in electric power distribution architectures at two voltage levels, comprising at least a first battery B1 at a first voltage level and a second battery B2 at second, higher voltage level, both provided with an automatic disconnection device SDB and intended for a differentiated electric power supply to respective network sectors provided with power distribution units (10), (20), (30) to the loads (12), (22), (23), (32), (33), each one of the units (10), (20), (30) being controlled by a corresponding microcontroller (10a), (20a), (30a), said at least first battery B1 and sector or sectors that it supplies being susceptible of being fed in turn from the second battery B2 through a converter DC/DC, said battery B2 being connected to a voltage generator, characterized in that said first battery B1, at a lower voltage level, has an associated module SMM associated based on a microcontroller applied to monitoring at least the voltage and current at the posts of said battery B1 and to sensing an operating state of said converter DC/DC, which monitoring module of battery B1 is connected through a port of its microcontroller and a communications network N with each one of control

microcontrollers (10a), (20a), (30a) of the power distribution units (10), (20), (30) to the loads (12), (22), (23), (32), (33), in order to, facing a short-circuit situation sensed by said monitoring module SMM, according to the detection of a predetermined state of the converter DC/DC, followed by some predetermined, sensed voltage and current values, inform each one of the microcontrollers (10a), (20a), (30a) of said power distribution units (10), (20), (30) in order to carry out a short-circuit protection process.

[c2] 2. A system according to Claim 1, characterized in that said communications network N is a dedicated network that links the microcontrollers (10a, 20a, 30a) of said power distribution units (10, 20, 30) or peripheral units thereof.

[c3] 3. A system according to Claim 1, characterized in that said communications network N is a shared bus, such as a CAN bus, that links the microcontrollers (10a, 20a, 30a) of said power distribution units (10, 20, 30) or peripheral units thereof.

[c4] 4. A system according to Claim 1, characterized in that said monitoring module SMM based on a microcontroller or control node CN is included in an assembly applied to the dynamical measurement of the state of health (SOH)

and state of charge (SOC) of said battery B1.

[c5] 5. A system according to Claim 1, characterized in that said monitoring module SMM based on a microcontroller or control node CN is included in an assembly applied to the control and management of all or part of the loads fed by said battery B1.

[c6] 6. A system according to Claim 1, characterized in that said power distribution units (10), (20), (30) to the loads (12), (22), (23), (32), (33) controlled by a microcontroller (10a), (20a), (30a), comprise a portion that supplies loads (22), (32) of said sector, at a lower voltage level, fed from battery B1, and a portion dedicated to said power loads (23), (33) included in said higher-voltage-level sector fed by said battery B2.

[c7] 7. A system according to Claim 6, characterized in that said power loads (23), (33) are governed from devices such as power switches (23a, 33a) with current sensing, the power switches (23a), (33a) of which are controlled from the corresponding microcontroller (20a, 30a) of the unit.

[c8] 8. A system according to Claim 7, characterized in that said power switches (23a), (33a) are FET devices with current sensing.

[c9] 9. A system according to Claim 1, characterized in that each one of said batteries B1 and B2 is provided with an electronic control module based on a microcontroller for controlling at least a disconnection device (SDB) of said batteries.

[c10] 10. A system according to Claim 7, characterized in that said power distribution units (10), (20), (30) comprise a connection of each one of said power switches (23a), (33a) to said microcontroller (20a), (30a) of the corresponding unit (20, 30) for a prior sensing of the voltage or impedance at the output of said power switches (23a), (33a) prior to connecting the controlled load (23), (33), allowing avoidance of said connection if said values are outside of some predetermined margins.

[c11] 11. A method for protection against short-circuits in electric power distribution architectures at two voltage levels, comprising at least a first battery B1 at a first voltage level and a second battery B2 at a second, higher voltage level, both provided with an automatic disconnection device SDB and destined to a differentiated supply of electric power to respective network sectors provided with power distribution units (10), (20), (30) to loads (12), (22), (23), (32), (33), each one of said units (10), (20), (30) being controlled by a corresponding mi-

crocontroller (10a), (20a), (30a), said at least first battery B1 and sector or sectors it supplies being susceptible of being fed in turn from the second battery B1 through a converter DC/DC, said battery B2 being connected to a voltage generator, characterized by performing permanent monitoring of at least the voltage and current at the posts of said battery B1, at a lower voltage level, as well as of the state of the converter DC/DC which interrelates said two batteries B1 and B2, and in that, in case it is sensed that said state of the converter DC/DC goes on to become a predetermined one, and after this said voltage and current values exceed a certain threshold, each one of the microcontrollers (10a, 20a, 30a) of said power distribution units is informed through a communications network N so as to perform a short-circuit protection process.

[c12] 12. A method according to Claim 11, characterized in that during the short-circuit sensing step, sensing of a stoppage state of the conversion process of the converter DC/DC, acquisition of voltage at the posts of battery B1, at a lower voltage level, and finally sensing of a possible load current of said battery B1 are performed in an ordered and sequential manner, so as to, if the predetermined values fall within pre-set ranges, proceed inform to power distribution units (10, 20, 30) about an

eventual short-circuit situation, by sending a priority interruption through said network N to the microcontrollers (10a, 20a, 30a) thereof.

[c13] 13. A method according to Claim 11, characterized in that said short-circuit protection process comprises a complete disconnection of all the power loads (23, 33) associated to each one of the power distribution units (20), (30), and in that, in case a short-circuit situation continues being sensed from said monitoring module, a signal is sent through said communications network N for disconnection of at least the higher-voltage-level battery B2, accessing in order to do so the disconnection device SDB of said battery B2 or a control node CN associated to said battery B2.

[c14] 14. A method according to Claim 11, characterized in that in case said complete disconnection of loads (23, 33) leads to a non-short-circuit situation, as evaluated by said monitoring module, a reconnection of the power loads (23), (33) of each power distribution unit (20, 30) is performed until sensing the load or loads susceptible of generating said short-circuit situation, as evaluated by said monitoring module.

[c15] 15. A method according to Claim 14, characterized in that prior to performing the reconnection of each one of

said power loads (23), (33), a measurement of the voltage or impedance at the output of a power switch (23a), (33a), applied to controlling a corresponding load (23), (33), is performed, and in that in case the measured values exceed a certain threshold, the involved load is left inactive.

[c16] 16. A method according to Claim 11, characterized in that said short-circuit protection process comprises progressively disconnecting all the power loads (23), (33) associated to each one of the power distribution units (20), (30), and checking, from said monitoring module, if a certain disconnection makes the short-circuit situation stop, in which case a permanent disconnection of the load involved is carried out, and in that in case a short-circuit situation continues being sensed from said monitoring module, after disconnection of all the power loads (23), (33) of each power distribution unit (20), (30), a signal for disconnection of at least higher-voltage-level battery B2 is sent through said communications network N, accessing in order to do so disconnection device SDB of said battery B2 or a control node CN thereof associated to said battery B2.

[c17] 17. A method according to Claim 11, characterized in that said short-circuit protection process comprises supervising of current demand in controlling devices, such

as a power switch (23a), (33a), associated to each one of the power loads (23), (33) depending from each one of the power distribution units (20), (30), and disconnecting those loads wherein said demand exceeds a certain threshold, and in that, in case a short-circuit situation continues being sensed from said monitoring module, after the supervision of all the power loads (23), (33) of each power distribution unit (20), (30), a signal for disconnecting at least the higher-voltage-level battery B2 is sent through said communications network N, accessing in order to do so the disconnection device SDB of said battery B2 or a control node CN thereof associated to said battery B2.

[c18] 18. A method according to Claim 11, characterized in that said power distribution units (20), (30) comprise devices such as power switches (23a), (33a), with current sensing, associated to each one of the power loads (23), (33), which power switches (23a), (33a) are controlled from the corresponding microcontroller (20a), (30a) of the unit, and by comprising a step of sensing the output state of each one of said switches (23a), (33a), particularly their voltage or impedance, so that if the value sensed in a certain power switch (23a), (33a) exceeds a certain threshold, connection of the load (23), (33) associated therewith is not carried out.

[c19] 19. A method according to Claim 11, characterized in that in case that at completion of said short-circuit protection process by each one of said power distribution units (10, 20, 30) a short-circuit situation continues being sensed by the monitoring module, disconnection of the two batteries B1 and B2 from their corresponding network sectors is carried out.